



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/806,466

03/23/2004

Shuichi Hirukawa

20455203200

1703

25227

7590

02/24/2006

MORRISON & FOERSTER LLP  
1650 TYSONS BOULEVARD  
SUITE 300  
MCLEAN, VA 22102

EXAMINER

SAYADIAN, HRAYR A

ART UNIT

PAPER NUMBER

2828

DATE MAILED: 02/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/806,466

Applicant(s)

HIRUKAWA ET AL.

Examiner

Hrayr A. Sayadian

Art Unit

2828

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --****Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 23 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **PRIOR ART REJECTIONS**

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 7, 9, 11, 13, 15, 17, and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by PGP U.S. Patent Application 2003/0048825, for inventor Hirukawa [hereinafter "Hirukawa"].

#### **With respect to claims 1, 7, 9, 11, and 15:**

Hirukawa discloses a semiconductor laser device (see FIG. 1 the growth of which is described by reference to FIGs. 2-4, see, for example, Column 3, ¶¶ [0056 and 0057]) in which, on an n-type GaAs substrate (Fig. 2, element 101, as described in ¶ [0057]),

there are at least an n-type cladding layer (Fig. 2, element 103, as described in ¶ [0057]), a lower guide layer (Fig. 2, element 104, as described in ¶ [0057]), an InGaAsP quantum well active layer composed of one or a plurality of well layers and a plurality of barrier layers alternately disposed (Fig. 2, element 105, as described in ¶ [0057]), an upper guide layer (Fig. 2, element 106, as described in ¶ [0057]), and a p-type upper cladding layer (Fig. 2, element 107, as described in ¶ [0057]), that are stacked, wherein the quantum well active layer is stacked so that an n-side barrier layer is present on a side of the lower guide layer and a p-side barrier layer is present on a side of the upper-guide layer, the n-side barrier having thickness of 70Å or more (Fig. 2, element 105, as described in ¶ [0057], has an n-side barrier having 100 Å thickness), the upper and lower guide layers being AlGaAs with Al mole fraction greater than 0.2 (Fig. 2, elements 104 and 106, as described in ¶ [0057], have Al mole fraction of .35), the well layers having compressive strain and the barrier layers having tensile strain (Fig. 2, element 105, as described in ¶ [0057], has the wells with compressive strain and the barriers with tensile strain), said semiconductor laser device having an oscillation wavelength of more than 760 nm and less than 800 nm (See, for example, Hirukawa, Abstract and Column 1, ¶ [0010]).

**With respect to claims 13 and 17:**

In Column 3, ¶¶ [0041] and [0042], Hirukawa discloses, quantities for well layer compressive strain and barrier layer tensile strain being less than 3.5%.

**With respect to claim 19:**

In Column 5, ¶ [0073], describing FIG. 7, Hirukawa discloses using device meeting the features and limitations of claim 1 in an optical disc unit.

4. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirukawa in view of U.S. Pat. No. 5,636,236 to Tada et al. [hereinafter "Tada"].

**With respect to claim 2:**

Hirukawa does not disclose making the p-side barrier thickness smaller than the n-side barrier thickness.

However, in the active region of a laser diode, Tada discloses making the width of the p-side barrier be less than that for the width of an n-side barrier.

And Tada motivates this modification to achieve uniform hole and electron carrier distribution. See, for example, Tada columns 4 and 6, lines 3-32 and 43-47, respectively.

Accordingly, it would have been obvious to modify the disclosure of Hirukawa to make the p-side barrier thickness smaller than the n-side barrier thickness to obtain uniform carrier distribution.

**With respect to claim 3:**

Hirukawa does not disclose making the p-side barrier less than 70Å. Instead the three barrier layers in Hirukawa are disclosed as having 100, 70, and 100 Å thicknesses, respectively.

Again, Tada however discloses and motivates reducing the barrier width in the active regions of MQW diode lasers.

And Tada specifically discloses an embodiment wherein the n-side barrier width is 80Å and the p-side barrier width is 20Å for an InGaAsP active region MQW diode laser to obtain uniform carrier distribution. See Tada column 6, lines 42-47 describing the structure shown in FIG. 12.

Accordingly, it would have been obvious to modify the disclosure of Hirukawa to make the p-side barrier thickness less than 70Å to obtain uniform carrier distribution.

5. Claims 4, 8, 10, 12, 14, 16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirukawa in view of U.S. Pat. No. 6,127,691 to Fukunaga et al. [hereinafter "Fukunaga"] and U.S. Pat. No. 6,154,476 to Nishiguchi et al. [hereinafter "Nishiguchi"].

**With respect to claim 4, 8, 10, 12, 14, 16, and 18:**

Hirukawa discloses all of the features and limitations recited in claims 4, 8, 10, 12, 14, 16, and 18 except for making the GaAs substrate p-type, as recited in independent claim 4.

Fukunaga however explicitly discloses that similar structures can be grown from/on p-type GaAs substrate. See, for example, Fukunaga column 6, lines 12-19.

Additionally, Nishiguchi discloses using a p-type GaAs substrate to grow laser diodes to allow using/integrating the laser diode with pnp transistors (which generally have higher operation speed than npn transistors) as the driving IC transistor. See, for example, Nishiguchi, column 1, lines 24-32, motivating the use of p-GaAs as the substrate for this specific motivation.

Accordingly, it would have been obvious to modify the disclosure of Hirukawa by using p-GaAs substrate instead of n-GaAs substrate to allow the easy integration with pnp transistors.

6. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirukawa in view of Fukunaga, and Nishiguchi, further in view of Tada.

**With respect to claim 5:**

The combination of Hirukawa and Fukunaga, as motivated by Nishiguchi, does not disclose making the p-side barrier thickness smaller than the n-side barrier thickness.

However, in the active region of a laser diode, Tada discloses making the width of the p-side barrier be less than that for the width of an n-side barrier.

And Tada motivates this modification to achieve uniform hole and electron carrier distribution. See, for example, Tada columns 4 and 6, lines 3-32 and 43-47, respectively.

Accordingly, it would have been obvious to modify the combination of Hirukawa and Fukunaga, as motivated by Nishiguchi, to make the p-side barrier thickness smaller than the n-side barrier thickness to obtain uniform carrier distribution.

**With respect to claim 6:**

The combination of Hirukawa and Fukunaga, as motivated by Nishiguchi, does not disclose making the p-side barrier less than 70Å. Instead the three barrier layers in Hirukawa are disclosed as having 100, 70, and 100 Å thicknesses.

Again, Tada however discloses and motivates reducing the barrier width in the active regions of MQW diode lasers.

And Tada specifically discloses an embodiment wherein the n-side barrier width is 80Å and the p-side barrier width is 20Å for an InGaAsP active region MQW diode

Art Unit: 2828

laser to obtain uniform carrier distribution. See Tada column 6, lines 42-47 describing the structure shown in FIG. 12.

Accordingly, it would have been obvious to modify the combination of Hirukawa and Fukunaga, as motivated by Nishiguchi, to make the p-side barrier thickness less than 70Å to obtain uniform carrier distribution.

#### **ADDITIONAL PRIOR ART OF RECORD**

U.S. Pat. No. 6,504,171 to Grillot et al. is made of record as also disclosing and motivating chirping the barrier/well thickness or compositions, or both, to increase laser diode output by making uniform the distribution of electron and holes within the active region of the laser diode. U.S. Pat. No. 5,780,867 to Fritz et al. is made of record as disclosing adjusting thickness of active region barriers to control transport and distribution of carriers across different strained quantum wells.

**CLOSURE**

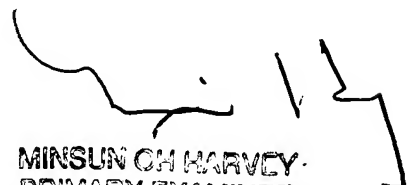
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hrayr A. Sayadian whose telephone number is (571) 272-7779.

The examiner can normally be reached on Monday through Friday, 7:30 am to 4:00 pm, ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun O. Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HAS



MINSUN O. HARVEY  
PRIMARY EXAMINER